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EXAMINER	
SMITH, JEFFREY S	
ART UNIT	**PAPER NUMBER**
2624	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	**Application No.** 10/678,426	**Applicant(s)** LIAO ET AL.	
	Examiner Jeffrey S. Smith	**Art Unit** 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25,27 and 30-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25,27 and 30-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 October 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Requirement For Information

1. Applicant and the assignee of this application are required under 37 CFR 1.105 to provide the following information that the examiner has determined is reasonably necessary to the examination of this application.

The information is required to document the level of skill and knowledge in the art of data compressing.

Does the inventor or assignee know of work by another performed before October 11, 2002, that includes operating a first and a second data to take a difference between the values of said first and said second data?

Does the inventor or assignee know of work by another performed before October 11, 2002, that includes encoding the difference into a recovery data code having a bit number less than m when the difference is less than a first threshold?

Does the inventor or assignee know of work by another performed before October 11, 2002, that includes encoding the difference into a recovery data code having a bit number equal to m when the difference is no less than the first threshold but no greater than a second threshold?

Does the inventor or assignee know of work by another performed before October 11, 2002, that includes encoding the difference into a recovery data code that is proportional to the difference?

Does the inventor or assignee know of work by another performed before October 11, 2002, that includes encoding the difference into a recovery data code proportional to the difference when the difference is greater than a threshold?

Does the inventor or assignee know of work by another performed before October 11, 2002, that includes encoding the second data into a recovery data code when the difference is greater than a threshold?

Applicant is reminded that failure to fully reply to this requirement for information will result in a holding of abandonment. This requirement is an attachment of the enclosed Office action. A complete reply to the enclosed Office action must include a complete reply to this requirement. The time period for reply to this requirement coincides with the time period for reply to the enclosed Office action.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the method steps of claims 1-21 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-25, 27, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,739,861 issued to Music ("Music") in view of U.S. Patent Number 7,050,639 issued to Barnes et al. ("Barnes").

For claim 1, Music recites "operating a first and a second data to take a difference between the values of said first and said second data" (see column 2 lines 30-34, which discuss a difference dU between a pixel U and a previous pixel U. See also column 3 lines 40-44, which disclose U and V differentials, and column 5 lines 49-50 which discloses subtraction of the luminosity of adjacent pixels).

Claim 1 further recites "encoding said difference into a first recovery data code having a bit number less than m when the absolute value of said difference is less than a first threshold; encoding said difference into a second recovery data code having a bit number equal to m when the absolute value of said difference is no less than said first threshold but no greater than a second threshold." Figure 5A of the drawings as originally filed shows an example of the first and second thresholds and the first and second recovery data code. As shown in Figure 5A, the first threshold is 8 and the second threshold is 15. When the difference is less than +8 and greater than –8 (in other words, the absolute value of the difference is less than 8), the first recovery data code is used, which is a code having less than 7 bits. When the absolute value of the difference is not less than 8 but not greater than 15, the second recovery data code is used, which is a code having seven bits.

The thresholds and the recovery data codes as shown in figure 5A of the application as originally filed are an example of a traditional Huffman code that has been well known since at least 1968. The traditional Huffman code is shown by Music in column 3 and column 7.

For example, as shown in column 3 of Music, when the absolute value of the difference is less than a first threshold such as 13, the first recovery data code is used, which is a code having less than 7 bits. When the absolute value of the difference is not less than 13 and not greater than a second threshold such as 54, the second data recovery code is used, which is a code having seven bits. As another example, as shown in column 7 of Music, when the absolute value of the difference is less than a first threshold such as 59, a first recovery data code having less than 5 bits is used. When the absolute value of the difference is not less than 59 and not greater than a second threshold such as 76, a second recovery data code having five bits is used.

Therefore, Music discloses “encoding said difference into a first recovery data code having a bit number less than m when the absolute value of said difference is less than a first threshold; encoding said difference into a second recovery data code having a bit number equal to m when the absolute value of said difference is no less than said first threshold but no greater than a second threshold” as shown in column 3 and column 7.

Barnes also discloses “encoding said difference into a first recovery data code having a bit number less than m when the absolute value of said difference is less than a first threshold; encoding said difference into a second recovery data code having a bit number equal to m when the absolute value of said difference is no less than said first threshold but no greater than a second threshold.” For example, as shown in figure 7 of Barnes, when the absolute value of the difference is less than a first threshold, such as 128, a first recovery data code having less than 17 bits is used. When the absolute value of the difference is no less than 128 and no greater than a second threshold, such as 255, a second recovery data code having 17 bits is used.

Barnes also discloses “and encoding said difference into a third recovery data code proportional to said difference when the absolute value of said difference is greater than said second threshold." When the absolute value of the difference shown in figure 7 is greater than 255, a third recovery data code having 19 bits is used. The third data recovery code is proportional to the difference because the Huffman code prefix and the code extension indicate the actual value of the difference.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the image compression device of Music with the image compression device of Barnes for the benefit of adapting the compression device to various systems depending upon characteristics of the images to be handled.

For claim 2, Music discloses luma values of two immediately adjacent pixels (see column 6 lines 10-12).

For claim 3, Music discloses chroma values of two immediately adjacent pixels (see column 2 lines 31-32).

For claim 4, Barnes in figures 7-12 shows code extensions that are equal to the difference having a bit number equal to m. Therefore at the time of the invention, it would have been obvious to a person of ordinary skill in the art to have a bit number of the third recovery code equal to m when a number of the absolute value of the difference is equal to m. Applicant has not disclosed that having a bit number equal to m as opposed to m+1 or m-1 or any other number provides an advantage, is used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with the bit numbers in the codes of Music, Barnes, or m, because each code performs the same function of compression equally well considering the typical size of image data.

Therefore, it would have been obvious to one of ordinary skill in this art to modify the code of Music and Barnes to obtain the invention as specified in claim 4.

For claim 5, Music has the bit number of the first code that varies with the difference (see column 3 lines 50-62).

For claim 6, Music has a tag bit representing the sign of the difference (see the most significant bit in column 7 lines 6-12).

For claim 7 Music has a third recovery code that corresponds to the difference, which ipso facto corresponds to half of the difference. Barnes has a third recovery code that corresponds to the difference, which by definition corresponds to half the difference.

For claim 8, Music has correlation tables for the first and second recovery data codes as shown in columns 6 and 7. Barnes in figures 7-12 has correlation codes.

For claim 9, Music has operating (column 2 lines 30-34), encoding said difference into a first recovery data code (column 6 lines 45-50), encoding said difference into a second recovery data code (column 6 lines 55-63), and encoding said second data into a third recovery data code when the absolute value of said difference is greater than said second threshold (see column 6 line 24). Music also has first, second and third codes as shown in column 3 and column 7. Barnes also discloses "encoding said difference into a first recovery data code having a bit number less than m when the absolute value of said difference is less than a first threshold; encoding said difference into a second recovery data code having a bit number equal to m when the absolute value of said difference is no less than said first threshold but no greater than a second threshold." For example, as shown in figure 7 of Barnes, when the absolute value of the difference is less than a first threshold, such as 128, a first recovery data code having less than 17 bits is used. When the absolute value of the difference is no less than 128 and no greater than a second threshold, such as 255, a second recovery data code having 17 bits is used.

Barnes also discloses "and encoding said second data into a third recovery data code when the absolute value of said difference is greater than said second threshold." When the absolute value of the difference shown in figure 7 is greater than 255, a third recovery data code having 19 bits is used. The third data recovery code is the second data when the absolute value of the difference exceeds 511.

For claims 10, Music discloses the luma values at column 6 lines 10-12.

For claim 11, Music discloses the chroma values at column 2 lines 31-32.

For claim 12, Music discloses that the bit number varies with the difference (column 3 lines 50-62).

For claim 13, Music has the tag bit (see column 7 lines 6-12).

For claim 14, Music has a third recovery data code equal to m (where m=7, see column 3 lines 23 and 61).

For claim 15, Music discloses the elements of base claim 9. Music does not explicitly disclose a designated bit grafted to selected bits of said second data. However, Music does disclose that if the difference between adjacent pixels exceeds a threshold, then a quantized value of the second data can be encoded as taught by Music at column 10 lines 40-43. It would have been obvious to one of ordinary skill in the art, at the time of invention, to include a designated bit with the quantized value, so that the decoder can distinguish the quantized second data value from the encoded differential values.

For claim 16, the quantization taught by Music can be performed by truncating the end bit of the second data.

For claims 17-20, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a characteristic bit for the third code for the benefit of allowing the decoder to distinguish the quantized third code from the differential first and second codes.

For claim 21, the data compressing method of claim 8 is used by a data decompressing method as discussed in columns 1 and 2.

For claim 22, Music shows in Figure 1 a first data register (11 or 16) for storing first and second data, an encoder (14) to obtain a difference, an encoder (15) to encode the difference into length variable recovery data code in a first condition, a first constant length code in a second condition, and a second constant length data code in a third condition (see column 3 lines 45-66). Barnes also discloses encoding said difference into a length-variable recovery data code having a bit number less than m when the absolute value of said difference is less than a first threshold; encoding said difference into a first constant-length recovery data code having a bit number equal to m when the absolute value of said difference is no less than said first threshold but no greater than a second threshold. For example, as shown in figure 7 of Barnes, when the absolute value of the difference is less than a first threshold, such as 128, a length-variable recovery data code having less than 17 bits is used. When the absolute value of the difference is no less than 128 and no greater than a second threshold, such as 255, a first constant-length recovery data code having 17 bits is used.

Barnes also discloses "and encoding said difference into a second constant-length recovery data code proportional to said difference in a third condition of said difference." When the absolute value of the difference shown in figure 7 is greater than 255, a third recovery data code having 19 bits is used. The third data recovery code is proportional to the difference because the Huffman code prefix and the code extension indicate the actual value of the difference.

For claim 23, Music discloses the first condition holds when the absolute values is less than a first threshold, the second condition holds between a first and second threshold, and the third condition holds when the difference is greater than the third threshold (see column 3 lines 18-24).

For claim 24, Music has a bit number for the first and second data equal to m.

For claim 25, the variable length code is less than m, and the constant length codes are equal to m, as shown in column 3.

For claim 27, which relate to the decoding features, Music has designed the encoding system to function with a decoding system as discussed in columns 1 and 2.

For claim 30, Music has a differential pulse encoding modulator (see the title).

For claim 31, Music has the data registers as discussed above. Barnes discloses a data compressing and decompressing device for use with an image pickup device and a frame buffer, comprises: a first data register in communication with the image pickup device for storing therein a first and a second data outputted by the image pickup device (figure 1 file server 18); a first encoder in communication with said first data register, operating said first and said second data to obtain a difference between values of said first and said second data (compression/decompression interface 20 and figure 6 step 290); and a second encoder in communication with said first encoder and said frame buffer, encoding said difference into a length-variable recovery data code in a first condition of said difference (figure 6 step 296 and figure 12 code extension for Huffman code prefix 00 through 11101 for the difference of ±479), encoding said difference into a first constant-length recovery data code in a second condition of said difference (code extension for prefix 111100 through 111101 for the difference of ±480 < difference < ±991), and encoding said second data into a second constant-length recovery data code in a third condition of said difference (actual value for difference > ±992).

For claim 32, which is the decompressing method for data compressed using the method of figure 31, Barnes performs the decompression of data compressed using the code shown in figure 12 using the compression/decompression interface 20.

Response to Arguments

1. Applicant's arguments filed March 16, 2007 have been fully considered but they are not persuasive.

The invention is solving the problem of the large amount of image data that is stored in the accelerated graphics port memory and send through the bandwidth of the peripheral component interconnect as discussed on pages 1 and 2 of the specification. To reduce the memory, applicant uses a traditional variable length coder to encode a parameter difference between adjacent pixels, although claims 1 and 9 are broad enough to read on traditional variable length coding and Huffman coding generally without limit to image data and pixel values. This reduces the amount of data, because the differences between adjacent pixels are usually very small except at edges. If the difference between adjacent pixels is large, then the efficiency of encoding the difference is low, so the method encodes a proportional value of the pixel value.

In other words, the method applies traditional variable length coding when a difference between first and second data is below a threshold, and applies an even more primitive form of coding when the difference is above a threshold. Claim 1 is broad enough that the proportion of the value can be the actual value itself. Indeed, claim 9 recites this aspect of the method, which is precisely what is performed in the prior art.

Although applicant attempts to distinguish variable length coding from fixed length coding in the first and second recovery data codes, such distinctions are unpersuasive because the only code that is used for the first and second codes is a traditional variable length code as shown in figures 5A and 5B. That is, both the first and second recovery data codes of claim 1 are actually only one traditional variable length code. Music discloses this aspect in column 3, where the code is variable length below a first threshold, applicant's definition of fixed length above the first threshold, and proportional to the second data above a second threshold value.

Furthermore, the way the method is claimed, the method requires only that a first code less than m is used when the difference is less than a threshold, a second code equal to m is used when the difference is between two thresholds, and a third code proportional to the difference is used when the difference exceeds a second threshold. Music discloses these features as discussed in the rejection above.

Applicant argues that

> The examiner cited Music's tables in column 6 lines 45-50, column 6 lines 55-63 and column 7 lines 5-12 to anticipate the three encoding steps of the present claim 1, respectively. However, as described in the paragraphs relevant to the tables, the three tables illustrate independent Small Blocks, Medium Small Blocks and Medium Large Blocks techniques, respectively. Music's column 10 lines 35-44 also show that one of these coding techniques is selectively used for encoding Y information. For each selected technique, all dY values are encoded into dY codes of the same bit number. Furthermore, Music does not teach or suggest the feature that said third recovery data code is proportional to said difference.

The argument by applicant identifies only one feature of the claim that is allegedly missing from Music, which is the third data code. Music discloses the third data code is proportional to said difference. The third data code is proportional to the difference because as the difference increases, the code value increases.

Applicant argues that

> Furthermore, Music does not teach or suggest the feature that said third recovery data code is encoded from said second data.

The admitted prior art discloses encoding the second data, which is the problem of the prior art that the invention is attempting to solve. Barnes discloses encoding the second data as discussed in the rejection of claim 31. Music discloses this aspect of claim 9 by quantizing the data values as discussed in column 6, and transmitting the maximum quantized value when the difference is large, as discussed in column 7 lines 25-37, which is said second data as recited in claim 9.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey S. Smith whose telephone number is 571 270-1235. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on 571 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JSS
March 22, 2007

JINGGE WU
SUPERVISORY PATENT EXAMINER